

REMARKS

Overview of the Office Action

Claims 1-14, 16-18, 20-34, 36-39, and 41-44 have been rejected under 35 U.S.C. §102(e) as anticipated by U.S. Patent No. 6,687,209 (“Ota”).

Claims 15, 19, 35, 40, and 45 have been rejected under 35 U.S.C. §103(a) as unpatentable over Ota.

Status of the claims

Claims 1-4, 7-11, 16-17, 21, 27-38, 40, 43, and 45 have been amended.

Claims 46 and 47 have been newly added.

Claims 22-26 have been canceled.

Claims 1-21 and 27-47 remain pending, with claims 1 and 36 being the only independent claims.

Rejection of claims 1-14, 16-18, 20-34, 36-39, and 41-44 under 35 U.S.C. §102(b)

The Office Action states that Ota teaches all of Applicants’ recited elements.

Before discussing the cited prior art and the Examiner’s rejections of the claims in view of that art, a brief description of the subject matter described in the present application is deemed appropriate to facilitate understanding of the arguments for patentability. The description is not meant to argue unclaimed subject matter.

According to Applicants’ recited invention, the objective lens 10 includes a diffractive structure 20, which has a plurality of blade-shaped diffracting ring-shaped zones 21. The optical surface of each diffracting ring-shaped zone 21 of Applicants’ recited invention is formed to

arrange a structure 22 that has a diffracting function in the diffractive structure 20. Applicants' recited objective lens 10 also includes an optical path difference giving structure 30, which forms a stepwise discontinuous surface composed of a plurality of divided surfaces 31, and which provides a prescribed optical path difference for a light beam passing through each structure 22 having a diffracting function (see paragraph [0205] and Figs. 2 and 3C of Applicants' specification).

Further, the diffractive structure 20 and the optical path difference giving structure 30 are both provided in the region A1 so as to superimpose the diffractive structure 20 and the optical path difference giving structure 30, so that at least one stepped shape of the optical path difference giving structure 30 is disposed inside the boundary of the optical surface 10a of one of the plurality of diffracting ring-shaped zones 21 in the diffractive structure 20 (see also Figs. 3A, 3C, 5, 6, 7, 11, 12A, 12B, 13, 14, 15, 16, and 17 of Applicants' specification).

Because the diffractive structure 20 and the optical path difference giving structure 30 are superimposed, the functions of both these elements are also superimposed when applied to light flux passing through the section of objective lens 10 that is inside and at the boundary of the optical surface 10a. Specifically, not only is the phase difference between the area equipped with the diffractive structure 20 and an area without a diffractive structure 20 reduced, but the diffraction efficiency of the light flux passing through the diffracting ring-shapes zones with the superimposed diffractive structure 20 and optical path difference giving structure 30 is improved.

Independent claim 1 is amended to recite "wherein the diffractive structure emits an L-th ($L \neq 0$) order diffracted light with a larger light amount than any other diffractive light, when the light beam having the first wavelength λ_1 passes through the diffractive structure, which emits an M-th ($M \neq 0$) order diffracted light with a larger light amount than any other diffractive light,

when the light beam having the second wavelength λ_2 passes through the diffractive structure". This portion of claim 1 is amended for clarification. Support for this limitation is found in the original version of claim 1 and paragraphs [0045]-[0047] of the published version of the application (US 2004/0062180). Independent claim 1 is further amended to recite "wherein the optical path difference giving structure is superimposed on the diffractive structure so that at least one stepped shape of the optical path difference giving structure is disposed inside the boundary of the optical surface of at least one of the plurality of diffracting ring-shaped zones". Support for this limitation is found in Fig. 2, and paragraphs [0204]-[0206] of Applicants' published application.

Ota fails to teach or suggest "wherein the optical path difference giving structure is superimposed on the diffractive structure so that at least one stepped shape of the optical path difference giving structure is disposed inside the boundary of the optical surface of at least one of the plurality of diffracting ring-shaped zones", as recited in Applicants' now amended claim 1.

Ota discloses an objective lens that is used for recording and/or reproducing information for two types of information recording media (CD and DVD). In the objective lens of Ota, areas that do not include a diffractive structure (i.e., areas having refractive surfaces) are provided on one optical surface to sandwich an area that does include a diffractive structure.

The objective lens 10 of Ota includes a refracting interface 11, a diffractive ring-shaped zone 13, and a refracting interface 12 (see Fig. 1; and col. 22, lines 19-31 of Ota). The objective lens 10 of Ota further includes a step portion 13a that is disposed only at the boundary between the refracting interface 11 and diffractive ring-shaped zone 13 (see col. 23, lines 25-26 of Ota). In other words, the step portion 13a of Ota is not disposed inside and at the boundary of the optical surface of the diffractive ring-shaped zone 13.

Light passing through the refracting interfaces 11, 12 of Ota suffers significantly less loss than the light passing through the diffractive ring-shaped zone 13 (see col. 22, lines 44-52 of Ota).

By providing the step portion 13a at the boundary between the refracting interface 11 and diffractive ring-shaped zone 13 as shown in Fig. 1 of Ota the phase shift between the light flux passing through the refracting interface 11 and diffractive ring-shaped zone 13 is suppressed (see col. 23, lines 25-42 of Ota). By providing the step portion 23a at the boundary between the refracting interface 22 and diffractive ring-shaped zone 23 as shown in Fig. 6 of Ota the Strehl ratio is enhanced (see col. 23, line 66 to col. 24, line 1 of Ota).

Since Ota discloses that a step is arranged at that boundary between the diffractive zone 13 and the refracting interface 11, Ota fails to teach or suggest “wherein the optical path difference giving structure is superimposed on the diffractive structure so that at least one stepped shape of the optical path difference giving structure is disposed inside the boundary of the optical surface of at least one of the plurality of diffracting ring-shaped zones”, as now recited in Applicants’ independent claim 1.

In response to Applicants’ previous arguments, the Examiner asserts that both Fig. 1 of Ota and Fig. 2 of Applicants’ specification shows same location for path giving structure. As discussed above, that allegation is not true. The step 13a of Ota is arranged at the boundary of the diffractive ring-shaped zone 13. In contrast, the step between the divided surfaces 31 of the optical path different giving structure 30 in Applicants’ Fig. 2 is within or inside the boundary of the associated diffracting ring-shaped zone 21. This difference is reflected in the limitation “wherein the optical path difference giving structure is superimposed on the diffractive structure so that at least one stepped shape of the optical path difference giving structure is disposed inside

the boundary of the optical surface of at least one of the plurality of diffracting ring-shaped zones”, as now recited in Applicants’ independent claim 1.

The Examiner also asserts that Applicants’ specification clearly states that “the optical path giving structure is provided in the peripheral region”, which confirms that the structure 30 is not on the diffractive structure 20 at all.

The above description in Applicants’ specification referred to by the Examiner relates only one of several embodiments, and to a region that is different from the region in which the optical path difference giving structure is superimposed on the diffractive structure, which is region A1 (see Fig. 2 of Applicants’ specification). As described in paragraph [0257] of Applicants’ specification, general diffracting ring shaped zones can also be disposed in the peripheral region A2. Further, in another embodiment, according to paragraph [0071] of Applicants’ specification, the diffracting region and the optical path giving structure are provided in the central region. Therefore, the sections of Applicants’ specification referred to by the Examiner do not directly relate to the feature recited in Applicants’ claims.

In view of the foregoing, Applicants submit that Ota fails to teach or suggest the subject matter recited in Applicants’ amended independent claim 1. Accordingly, claim 1 is deemed to be patentable over Ota under 35 U.S.C. §102(b).

Claim 36 has been amended to recite limitations similar to claim 1 and is, therefore, deemed to be patentably distinct over Ota for at least those reasons discussed above with respect to independent claim 1.

Dependent claims

Claims 22-26 have been canceled. Claims 2-14, 16-18, 20-21, 27-34, 37-39, and 41-44, which depend from independent claims 1 and 36, incorporate all of the limitations of the respective independent claim and are, therefore, deemed to be patentably distinct over Ota for at least those reasons discussed above with respect to independent claims 1 and 36.

Rejection of claims 15, 19, 35, 40, and 45 under 35 U.S.C. §103(a)

The Office Action further states that Ota teaches Applicants' recited elements in claims 15, 19, 35, 40, and 45.

Ota has been previously discussed and does not teach or suggest the invention recited in Applicants' independent claims 1 and 36.

Claims 15, 19, 35, 40, and 45, which depend from independent claims 1 and 36, incorporate all of the limitations of the respective independent claim and are, therefore, deemed to be patentably distinct over Ota for at least those reasons discussed above with respect to independent claims 1 and 36.

Newly added claims 46-47

Claims 46 and 47 have been newly added. Support for newly added claim 46 and 47 can be found in Applicants' original claim 21 and original claim 1, respectively.

Claims 46 and 47, which depend from independent claim 1, incorporate all of the limitations of independent claim 1 and are, therefore, deemed to be patentably distinct over Ota for at least those reasons discussed above with respect to independent claim 1.

Conclusion

In view of the foregoing, reconsideration and withdrawal of all rejections, and allowance of all pending claims is respectfully solicited.

Should the Examiner have any comments, questions, suggestions, or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

Respectfully submitted,
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